

The Examiner has rejected claims 1 – 6 under 35 U.S.C. 102 (b) as being anticipated by Kepner et al. (U.S. Patent 6,342,191 B1).

Kepner discloses a process for producing an enhanced adsorbent particle comprising contacting a non-ceramic, porous, oxide adsorbent particle with an acid for a sufficient time to increase the adsorbent properties of the particle. See Kepner, Col. 8, lines 36 – 40. The Kepner inventors believed that the acid contacting of the particle enhances the adsorptive capacity of the particle by increasing the number of hydroxyl groups on the particle. See Kepner, Col. 9, lines 9 – 12. Preferred adsorbent particles disclosed by Kepner include aluminum oxide, silicon dioxide and vanadium pentoxide. See Kepner, Col. 10, lines 14 – 19.

Kepner also discloses that, in a preferred embodiment, the particle is microporous, even more preferably substantially microporous, having a median micropore size preferably of from 3.5 nm to 35 nm (35 Å to 350 Å) diameter. See Kepner, Col. 10, lines 19 - 22. Kepner discloses that each particle is contacted with an acid and that the length of time the particle must be contacted with the acid varies according to the ability of the particular particle to generate hydroxyl groups on the surface and pores of the particle. See Kepner, Col. 12, lines 28 – 35. Kepner further discloses that the composition can comprise an aluminum oxide particle and a co-particle which can be vanadium pentoxide or a zeolite. See Kepner, Col. 14, lines 35 – 47. Kepner also discloses that, preferably, the composition is held together using a colloidal alumina binder that has been crosslinked. See Kepner, Col. 14, lines 62 – 63. Kepner discloses that the crosslinking temperature, and thus the heating step, is from 50° C, 70°C, 110°C, or 150°C to 200°C, 250° C, 300°C or 350° C. See Kepner Col. 22, lines 6 – 9. Kepner also distinguishes cross-linking from calcining. Kepner states that while calcining removes any residual water that may be on the particle as well as change the lattice structure of the particle to form a crystalline particle, it also removes the hydroxyl groups on the binder that are required for crosslinking.

Therefore, according to Kepner, heating the system during or after the crosslinking step to a temperature above the cross-linking temperature into the particle or binder calcining temperature range or above is detrimental to the system. Kepner goes on to state that “Thus, prior art systems, where mixtures of colloidal alumina and/or colloidal silica are (1) calcined or recalcined or (2) heated to form a refractory material are not part of this invention.” See Kepner, Col. 22, lines 19 – 44. Kepner also discloses that the size and shape of the particles used in their invention prior to extruding can vary greatly depending on the end use, and that typically, for adsorption or catalytic applications, a small particle size such as 5  $\mu\text{m}$  or greater to about 250  $\mu\text{m}$  are preferable because they provide a larger surface area than large particles. See Kepner, Col. 23, lines 15 – 20.

Applicants point out that the Kepner reference does not disclose a composition comprising vanadium and a support selected from the group consisting of: 1) amorphous silica-alumina; 2) a zeolite; 3) a material comprising meta-kaolin, alumina and expanded perlite; 4) alumina; and 5) combinations thereof, but instead discloses separate adsorbent particles which can be either vanadium pentoxide, aluminum oxide or a zeolite, among other particles. Kepner does not disclose the use of either alumina or a zeolite as a support for vanadium. In fact, rather than supporting vanadium on a support, Kepner combines vanadium pentoxide, aluminum oxide or zeolite particles by use of a colloidal binder, with each of the separate particles being treated with an acid in order to increase their adsorptive functionality by generating hydroxyl groups on the surface and pores of each particle. This is clearly not the same as a composition comprising vanadium and a support. Further on this point, the restrictions regarding the heating temperature in Kepner are based on avoiding the removal of hydroxyl groups needed for cross-linking the various particles together.

Applicants also point out that Kepner does not disclose that the vanadium has a particle size of 35 Å, but rather discloses that the particles, which includes the vanadium pentoxide, have a **median micropore size** which is preferably from 35Å to 350Å in diameter. Kepner does disclose that the **minimum particle size** for each of the particles including the aluminum oxide, vanadium pentoxide, and zeolite, is 5 µm which is equivalent to 50,000Å. Thus, Applicants point out that the Kepner reference does not disclose that at least a portion of said vanadium has crystallite sizes of less than about 100 Å. In fact, as stated above, the vanadium pentoxide of Kepner is in the form of particles having a minimum particle size of 50,000Å (5 µm) up to about 2,500,000 (250 µm), certainly not less than about 100Å which is a limitation in claim 1 of the instant application.

Thus, Applicants submit that independent claim 1 and each of the claims depending variously therefrom, and independent claims 5 and 6 are patentably distinguishable over the Kepner reference. Applicants respectfully request that the Examiner reconsider and withdraw this rejection.

The Examiner has rejected claims 7 – 16 under 35 U.S.C. 102 (b) as anticipated by or, in the alternative, under 35 U.S.C. 103 (a) as obvious over Kepner et al. (U.S. Patent 6,342,191 B1).

As stated above, Applicants point out that the Kepner reference does not disclose vanadium having a particle size of 35Å, but rather a minimum particle size of 50,000Å. Again, the intent of the Kepner reference is to bind two or more particles together using a binder, wherein each particle has been separately treated with an acid in order to increase the adsorptive capacity by generating hydroxyl groups on the surface and pores of such particles. Kepner clearly does not disclose a vanadium supported by alumina or a zeolite, anymore than it discloses alumina or zeolite supported on vanadium, but does disclose the binding together of particles

such as vanadium pentoxide, aluminum oxide, or a zeolite having minimum particle sizes of 50,000Å using a colloidal binder.

Applicants submit that the Kepner reference does not disclose the limitations of claim 7 of the instant application that the composition comprises vanadium and a support and that said calcination temperature is below the temperature which would result in the conversion of greater than about 90 weight percent of the vanadium to vanadium-and-oxygen-containing crystallites greater than about 100Å in size. In fact, as stated above, Kepner discloses a **minimum** particle size for the vanadium pentoxide, aluminum oxide or a zeolite, among other particles, of 5µm (50,000Å). In addition, Applicants were unable to find, and the Examiner has not pointed out, the limitation in independent claim 7 that the inventive composition is heated in the presence of oxygen and a solvent to a calcination temperature.

Thus, Applicants submit that independent claim 7 and all of the claims depending variously therefrom are patentably distinguishable over the Kepner reference. Applicants respectfully request that the Examiner reconsider and withdraw this rejection.

#### **Response to Examiner's "Response to Arguments"**

Applicants are unclear as to the meaning of the Examiner's statement that Applicant's argument that "Kepner discloses a process for producing an enhanced adsorbent particle comprising contacting a non-ceramic, porous, oxide adsorbent particle with an acid for a sufficient time to increase the adsorbent properties of the particle" is not persuasive. Applicants point out that this is a direct reference taken from Kepner at Col. 8, lines 36 – 40.

The Examiner states that Applicant's argument that "Kepner does not disclose the claimed limitations of claim 1, but instead discloses separate adsorbent particles which can be either vanadium pentoxide, aluminum oxide or a zeolite, among other particles," is not persuasive.

Applicant's point out that Kepner discloses the use of non-ceramic, porous, oxide adsorbent particles (See Kepner, Col. 8, lines 36 – 40), that such particles preferably include aluminum oxide, silicon dioxide and vanadium pentoxide (See Kepner, Col. 10, lines 14 – 19), and that small particle sizes such as 5 $\mu$ m or greater to about 250 $\mu$ m are preferable. Thus, Applicants fail to see how Applicants' statement that "Kepner discloses separate adsorbent particles which can be either vanadium pentoxide, aluminum oxide or a zeolite, among other particles" is not persuasive to the Examiner, as it is clearly taken directly from the Kepner reference. Clearly, Kepner does not disclose a composition comprising vanadium and a support material.

Regarding the Examiner's statement that "Applicant appears to admit that 35 Angstroms, which is less than 100 Angstroms, is disclosed" is not correct. Applicants in fact point out that Kepner discloses a range for particle size (including vanadium pentoxide) of from 50,000Å up to about 2,500,000Å, not less than 100Å. The Examiner has incorrectly concluded that the reference in Kepner at Col. 10, lines 19 – 22 that the particles (including the vanadium pentoxide) are "preferably substantially microporous, having a median micropore size preferably of from 3.5 nm to 35 nm (35Å to 350Å) diameter" means that the particle sizes in Kepner are 35Å to 350Å. Applicants point out that the median micropore size diameter is the diameter of the micropore void spaces within the particle, while the particle size diameter is the diameter of the whole particle itself.

In view of the remarks above, claims 1 – 16 are believed to be in condition for allowance.  
Therefore, early allowance for each of claims 1 – 16 is respectfully requested.

Respectfully submitted,

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